

MSC Guidelines for Review of Automatic Sprinkler Systems

Procedure Number: E1-27

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References

- a. Title 46 CFR 76.25
- b. National Fire Protection Association (NFPA) 13, 1996 Edition, "Installation of Sprinkler Systems"
- c. Navigation and Vessel Inspection Circular (NVIC) 8-93, "Equivalent Alternatives to 46 CFR Subchapter H Requirements Related to Means of Escape, Safe Refuge Areas and Main Vertical Zone Length"
- d. Policy File Memorandum (PFM) 1-97, "Guidance for Use of Exposed Copper Pipe with Automatic Fire Sprinkler and Water Mist Systems on U.S. Vessels"

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MSC Guidelines for Review of Automatic Sprinkler Systems (cont'd)

General Review Guidance

- ❑ Partial installation of sprinklers is not acceptable. Spaces protected by other fire protection systems which are separated by A-60 boundaries from the sprinkled areas need not be provided with sprinklers. Concealed spaces constructed of or containing combustible materials shall be sprinkled (9-1.3 & 9-4.4)
- ❑ Sprinkler zones shall not encompass more than two adjacent decks or more than one main vertical zone. (9-4-12.2)
- ❑ Hydraulic calculation procedures, either area density or room design methods, shall be used to design the system. If using the area-density method, the water supply shall be based on the area-density curves shown in figure 5-2.3 of reference (b). For light hazard installations, .1 gpm over 1500 ft² is commonly used. For ordinary group I hazards installations, .15 gpm over 1500 ft² is commonly used. (9-5.1)
- ❑ Verify that the correct occupancy hazard type is used for each space. Light hazard includes public spaces and control stations. Ordinary Group I includes galleys, storage areas and laundries. (A-9-1.2)
- ❑ Sprinklers shall be listed for the specific type hazard (light, ordinary) and type of system (wet or dry) in which they are to be used. Verify listing in the UL Fire Protection Equipment Directory or manufacturers technical data sheets. (4-3.1.1)
- ❑ A sprinkler orifice shall not be less than a nominal 3/8 inches; the minimum discharge coefficient (K factor) is 2.9. Sprinkler nozzle operating pressure shall not be less than 10 psi. (9-2.1)
- ❑ A dedicated pump sized to meet the water demand of the hydraulically most demanding area shall be provided. The pump shall be listed for marine service; UL listed fire pumps are acceptable. Pumps shall not exceed 120% of rated capacity. (9-6.3.1 & 2)
- ❑ Vessels subject to NVIC 8-93, shall have two sprinkler pumps sized to meet the water demand of the hydraulically most demanding area.

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- ❑ Where two sprinkler pumps are required, a dedicated fire pump is permitted to be used as the second pump provided that : (9-6.3.7)
 - ❑ The pump has the capacity to meet the fire hose and sprinkler system pressure and flow demands simultaneously.
 - ❑ The fire main is segregated by a normally closed valve that opens automatically upon failure of the primary sprinkler pump.
 - ❑ The fire pump starts automatically upon failure of the sprinkler pump or loss of sprinkler system pressure
- ❑ A pressure tank sized to meet the flow and pressure requirements of the hydraulically most demanding area for one minute is required. For a dry pipe system, the volume required to fill the dry pipe shall also be included in the tanks volume. Multiple tank installations are acceptable. (Note: An alternative installation is outlined in the standard). (9-6.2.1)
- ❑ The pressure tank shall be constructed in accordance with Title 46 CFR Subchapter F.
- ❑ Ferrous piping materials shall conform to the material specifications and design standards listed in reference (b), tables 2-3.1 and 2-4.1. Ferrous materials subjected to salt water shall be galvanized or be extra heavy schedule material. Materials other than those noted are acceptable in wet pipe systems in accordance with their listing. (2-3, 2-4, 9-2.4)
- ❑ Steel pipe < 8 inches in diameter, joined by threaded fittings, shall be a minimum of schedule 40. Steel pipe ≥ 8 inches in diameter, joined by threaded fittings, shall be a minimum of schedule 30. (2-3.3)
- ❑ Steel pipe ≤ 5 inches in diameter, joined by welding or rolled groove fittings, shall be a minimum of schedule 10. (2-3.2) Listed grooved type fittings are acceptable only in sprinkler systems located outside of the engine room. (MSC-2 policy letter E1-9600554)
- ❑ Copper pipe is limited to ASTM B-88, types M, L and K or ASTM B-42 materials. Copper and brass pipe shall be used only in wet pipe systems protecting light and ordinary hazard areas, pressures shall not exceed 250 psi. (ref. d and 9-2.4.2)

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- ❑ Copper pipe shall not be located in or routed through cargo or vehicle decks, machinery spaces containing boilers, internal combustion engines, pressurized fuel or lubricating line or storage spaces for combustible liquids or gasses under pressure. (ref. d)
- ❑ Joints and connections for ASTM B-88 tubing shall be brazed. Joints and connections for ASTM B-42 tubing shall be brazed, threaded or UL listed mechanical type. (ref. d)
- ❑ Brazing filler materials shall have a solidus melting temperature of not less than 1000⁰ F. Bcup-2, Bcup-3, Bcup-4, Bag-5, Bag-1, Bag-2 and Bag-7 filler materials are acceptable. (ref. d)
- ❑ Verify that a sufficient number of sprinklers are provided for the coverage area based on the type sprinkler, hazard type and space construction:
 - ❑ Pendent sprinklers (4-6.2.2)
 - ❑ Light haz./noncomb or comb. unobstructed constr: 225 ft²
 - ❑ Light haz./comb. obstructed constr: 168 ft²
 - ❑ Ordinary hazard: 130 ft²
 - ❑ Sidewall sprinklers (4-7.2.2)
 - ❑ Light haz./noncomb or limited comb. constr: 196 ft²
 - ❑ Light haz./ comb. constr: 120 ft²
 - ❑ Ordinary hazard/noncomb or limited comb. constr: 100 ft²
 - ❑ Ordinary hazard/comb constr: 80 ft²
- ❑ Verify proper sprinkler placement and spacing based on the sprinkler type and hazard:
 - ❑ Pendent Sprinklers (light and ordinary hazards) (4-6.3)
 - ❑ Between sprinklers: 6' – 15'
 - ❑ Distance from walls: 4" – 7.5'
 - ❑ Distance below ceiling: 1" – 12"
 - ❑ Sidewall Sprinklers (4-6.3)
 - ❑ Between sprinklers in light hazards: 6' – 15'
 - ❑ Between sprinklers in ordinary hazards: 6' – 10'
 - ❑ Distance from walls in light hazards: 4" – 7'
 - ❑ Distance from walls in ordinary hazards: 4" – 5'
 - ❑ Distance below ceilings: 4" – 6"

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- ❑ Valves shall be positive shut-off or category A type valves constructed in accordance with the material specification and design requirements of 56.60 and 56.20, respectively. (9-2.6.2)
- ❑ Indicating, water supply and zone control valves shall be supervised in the open position at a central operating station. Locking open of valves is **not** an acceptable method of supervision. (9-2.6.1)
- ❑ Monitoring devices and individual alarms, located at a central operating stations, shall be provided for the following: (9-4.12)
 - ❑ Water supply valve positions
 - ❑ Sprinkler pump power and operation
 - ❑ Pressure tanks levels, pressure and temperature
 - ❑ Zone water flow alarms
 - ❑ Dry pipe valve pressures (as applicable)
- ❑ Listed water flow alarms shall be provided for each zone. Paddle wheel type alarms are acceptable only on wet type systems (2-9.1 & 2-9.2.4)
- ❑ Fire department and Int'l shore connections shall be provided near the gangway or other location so that they are readily accessible to a landbased fire department. Connections may be required on both sides of vessels depending on shore access arrangements. (9-2.7.1)
- ❑ The firemain shall be cross-connected to the sprinkler system. A lockable, screw down, non-return valve shall be installed to prevent backflow from the sprinkler system to the firemain.. (9-6.4.3)
- ❑ The fire dep't cross connect for a wet pipe system shall be connected downstream of the sprinkler pump discharge check valve. For a dry pipe system, the connection shall be located between the sprinkler pump check valve and the dry valve. (4-15.2.3)
- ❑ Shutoff valves are prohibited in the fire dep't cross connect piping. A listed check valve shall be provided at each water supply including the fire dep't connection. (4-15.2.4.)

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- ❑ Dry pipe systems with capacities > 500 gallons shall be equipped with a listed quick opening device. Not more than 750 gallons system capacity shall be controlled by one dry pipe. Larger dry pipe non-gridded systems are acceptable if the design is such that water is delivered to the test connection within 60 seconds of activation. (3-2.3)
- ❑ Sprinklers shall be installed to protect windows at a distance not to exceed 1 foot from the window; sprinkler spacing shall not exceed 6 feet. The window surface should be wetted at a rate not less than 6 gpm/ft. (9-4.3)
- ❑ Windows located along an egress route must be A-0 rated and be protected by the sprinkler system. (SOLAS vessels only)
- ❑ Test connections shall be provided for each water flow alarm and dry pipe valve. (4-15.1.1.3)
- ❑ Flow alarm and dry pipe test connections shall not be less than 1 inch in diameter and shall have an orifice equivalent to that of the smallest sprinkler in the system. If required, the dry pipe test connection shall be located in the most distant sprinkler pipe. (4-15.4.2 & 3)
- ❑ A drain/test connection shall be provided on the discharge side of the sprinkler pump. The pipe should be of adequate size to discharge the amount of water required by the hydraulically most demanding area. (9-6.3.5)
- ❑ Drain and test lines shall not be connected to housekeeping, sewage or deck drains; drainage to the bilge is acceptable. Test/drain overboard discharge connections shall conform to the overboard discharge requirements of 56.50-95. (9-4-11)
- ❑ For wet pipe systems, listed pressure gauges are required in each riser and on both sides of alarm check valves and at each alarm flow switch of a wet pipe system. (3.1.1)
- ❑ For dry pipe systems, listed pressure gauges are required on both sides of the dry pipe valve, at the air compressor/receiver, air supply pipe to the dry pipe system, and at exhausters/accelerators. (3.2.1)

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- ❑ Return bends are required on pendent type sprinklers that are used in wet pipe systems. (4-3-17 & 9-4.8)
- ❑ Two sources of power with separate feeders are required for all sprinkler system pumps. The normal source of power shall be the emergency switchboard. (9-6.3.4)
- ❑ The compressed air source for a dry pipe system shall be capable of restoring normal pressure on the system within 30 minutes. (3-2.6.2)
- ❑ The dry pipe pressure shall be maintained IAW dry pipe valve instructions or 20 psi in excess of the pressure required to trip the valve. (3-2.6.7)
- ❑ The dry pipe air connection shall not be less than ½ inch in diameter and shall enter the system above the priming water level of the dry pipe. A renewable seat type stop valve and check valve are required. (3-2.6.3)
- ❑ Two sources of power with separate feeders are required for the air compressors that supply air to the pressure tank. The normal source of power shall be the emergency switchboard. (9-6.2.3)
- ❑ A gauge glass shall be provided on the pressure tank. (9-6.2.1c)
- ❑ Valves shall be provided on the pressure tank air connection to prevent backflow of water into the air system and to restrict the amount of air entering the tank. (9-6.2.6)
- ❑ Verify that the correct friction loss value (C) for the type of pipe used is applied in the calculations (galvanized pipe C=120). (6-4.4.5)
- ❑ Verify that the correct equivalent pipe length for each pipe fitting are used in the calculations. (Table 6-4.3.1)
- ❑ Verify that the pipe dimensions and locations in the calculations are consistent with that shown on the arrangement plans.
- ❑ Control, drain and test valves shall be provided with metal or plastic identification tags secured with corrosion resistant wire or chain. (2-7.3)

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- ❑ Pipes shall be supported by primary structural members of the vessel such as beams, girders, and stiffeners. Pipe supports shall be welded to the structure. With the exception of the portion welded to the structure, pipe supports shall be listed. (9-2.5.1)
 - ❑ U-hook type pipe supports shall be sized in accordance with table 2-6.4.1
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Attachments

- ❑ None